

# Capturing rights and duties in a business process model

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## Abstract

This paper focuses on the problem of the inclusion of important legal aspects into a process model, which are an undividable part of a process spanning several businesses. The discussed aspects are those duties and rights present in legal documents that regulate the places where one process crosses from one business into the other. We define an example scenario and on this basis analyse the capabilities of contemporary process modelling languages to capture rights and duties in a process model correctly. Upon unsatisfactory results, we analyse and formalise the concept of the duty and the right in order to be able to capture them properly. We also create an extension to the PSD modelling language, which allows an analyst to capture duties and rights explicitly, and demonstrate its capabilities using the example scenario.

## Keywords

Business process modelling, BPMN, duties and rights, EPC, PSD.

**JEL Classification:** L20, M15, K0

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## 1. Introduction

Processes today are not just internal issues of individual companies. Today's focus on business process management emphasises precise synchronisation among cooperating businesses, and so formed processes spread across several cooperating business, joining suppliers, producers and retailers into one virtual business (Voříšek et al., 2008).

This places high requirements on process modelling and the complexity of the created process models, which are used as a basis for business process management. These models have to capture not only the relations between activities (Sharp and McDermott, 2009) within one business but also all relations across cooperating businesses. Linkages among businesses are special places that stress different details than regular intra-business relations. Strong attention is paid to these places. The focus is not only on performance, but also on legal issues. In these places, who is responsible for what and what the consequences are become of crucial importance since these aspects may not only hurt performance, but also become a cause or a subject for a lawsuit. This is rare for regular intra-business processes.

Inter-business linkages are usually formally defined within legal documents (prime contracts, service level agreements, laws), which state in detail the rights and duties of each party in such way as to be reviewable and enforceable by a third party (an arbiter or a court). By contrast, regular intra-business processes, which are described in internal business instructions and procedures, are not usually subject to third party review. Their enforcement is solved usually within employment contract boundaries and therefore the focus is mainly on the sequences of activities important for the correct process performance.

The described legal aspect of inter-business processes places high requirements on process models, which should include in these cases all relevant details since even only one missing or misleading piece may result in activities that cross contract boundaries or law limits and may result in civil or even criminal prosecution.

Inter-business processes are not the only ones that have to take into account legal aspects. They are

important in other areas of management, too, especially in public administration, where most procedures are set by laws or public notices, such as the Act 500/2004 Coll. on Administrative Procedure Code or the Act 99/1963 Coll. on Code of Civil Procedure, and their fulfilment may be claimed in court.

When looking at the relevant literature, we can find some attempts to include legal aspects in process models in the field of modelling public administration processes. Works such as Alpar and Olbrich (2005), Ciaghi et al. (2010, 2011) and Businska et al. (2012) suggest how to include legal regulations in a process model, but their solutions are based only on the introduction of symbols that represent references to regulations. The clear definition of what a right is and what a duty is stays hidden from the process model in the referenced regulations. Other authors go deeper (Weldemariam et al., 2011) but they turn away from the business process management perspective to computer-aided law analysis using specific structure description languages such as Nòmos (Siena, 2010).

In this paper, we analyse from a business process management perspective the need and possibility for the inclusion of the basic platforms of the discussed legal aspects, namely the duties and rights of each party (Pecina, 2006b), in a process model. The objectives are to specify the weaknesses of contemporary business process modelling languages when used for capturing duties and rights in a process model and to provide a solution for how to capture these duties and rights more precisely.

This paper is divided into three main sections. First, we define an example scenario and capture it in three different process modelling languages. Based on these models, we analyse how well contemporary process modelling languages can capture duties and rights.

Second, we analyse and formalise a duty and a right, using the relevant literature, in order to be able to capture them in a process model correctly. Based on the analysis, we define an extension for contemporary process modelling languages, which would allow them to capture duties and rights more precisely.

Third, the defined extension is then implemented in the PSD modelling language and its benefits on the example scenario are demonstrated.

## 2. Duties and rights in contemporary process modelling languages

In order to be able to analyse how well contemporary process modelling languages can capture duties and rights, we have to define a simple supply chain management scenario. This scenario is focused on that part of a production process in which two parties (a vendor and a buyer) meet and which is usually regulated by a supply agreement. In order to keep the model clear and focused, the example captures only a part of the supply process.

### 2.1 Example scenario definition

In this example, we have two parties bound by a supply agreement: a vendor and a buyer. After 14 days of the supply agreement having come into effect, the vendor is held, on basis of the agreement, responsible for keeping the buyer's inventory level at a certain level (in this case, 5). The vendor stores the supplied goods in its own or rented storage and keeps the defined inventory level in the buyer's inventory. If the level goes under the defined limit, a 7-day time limit starts during which the vendor has to increase the inventory level in order to be compliant with the supply agreement. If the vendor manages that, the time limit is interrupted. If not, further steps are taken. Failure does not have to always be the vendor's fault. Situations such as natural disasters, strikes at the buyer's facility and so on make keeping the stock at the agreed level impossible. If the responsibility for the failure is on the vendor's side, the buyer has the right (according to the agreement) to ask for a penalty payment. If it is not, the supply agreement forbids any action from the buyer's side that would lead to backing out of the supply agreement. If the buyer notifies the vendor that it requires the penalty payment, the vendor is obliged to pay it within 7 days and it is responsible for the bank making the bank transfer within the time limit. If the vendor fails to comply, the buyer has the right to back out of the supply agreement. The process would then continue with the description of what has to be done in order to replace the missing vendor and its supplies, but that is outside the scope of this example.

### 2.2 Models

We capture the example in three process modelling languages. Two of these are nowadays popular (Becker et al., 2010), namely the BPMN (Object Management Group, 2011) and the EPC (IDS Scheer AG, 2012), while the other tackles process modelling from

a slightly different perspective, namely the PSD (process state diagram), as introduced in Svatoš (2011).

With the exception of the BPMN, the actor of all activities is in this scenario the buyer and so this role is not captured explicitly. When we compare the models in the three figures below (Figures 1, 2 and 3) with the scenario definition, we can see the following differences.

Solutions to the vendor's duty to keep the stock level at a certain level vary. In the case of the EPC and PSD models, the vendor's duty to check the stock level is hidden. The modelled processes capture the activity of checking the level by the buyer and the further resolution if the stock level falls below the limit, but the actual duty of the vendor is missing. One may guess it from the model, but we expect more than that from the model. The BPMN is more successful in this area. By using the escalation event, it is possible to capture the vendor's duty including the escalation if it is not fulfilled properly. The downside of this solution is the necessity to model the vendor's activity in greater detail than the situation requires. Modelling the activity's sub-process brings into the model detail from the vendor's side that is in this model for the sake of clarity kept simple – in reality it would be much more complicated. How the vendor actually fulfils its duty is not the subject of the example scenario. All we need is to capture the vendor's duty to keep the stock level at a certain level.

The buyer's duty (*no cancellation of the supply agreement*) is hidden in the complex text associated with the final process state and can be easily overlooked. It is more like a textual comment than a formal representation.

We can find the decision *whether to require the penalty payment* in the models, but the actual right (enforceable norm) that makes this possible is missing. The representation of a right as a choice is not precise, since choosing not to take advantage of one's right does not mean that the right's validity is over. The possibility that the process will continue is driven by the individual validity of the right, which is usually time limited (either by a time limit in the agreement or by a regulation regulating the time limits in general). Only then, the process ends.

Put a better way, how to capture this is as a synchronisation with an event, which signifies taking advantage of the right (such as the Notice Delivery to Vendor in the PSD model). However, this would make the process as appear to be a confusing flow of events when captured in the BPMN or the EPC, since it would break the idea of relations of activities and the actors would become parts of the text com-

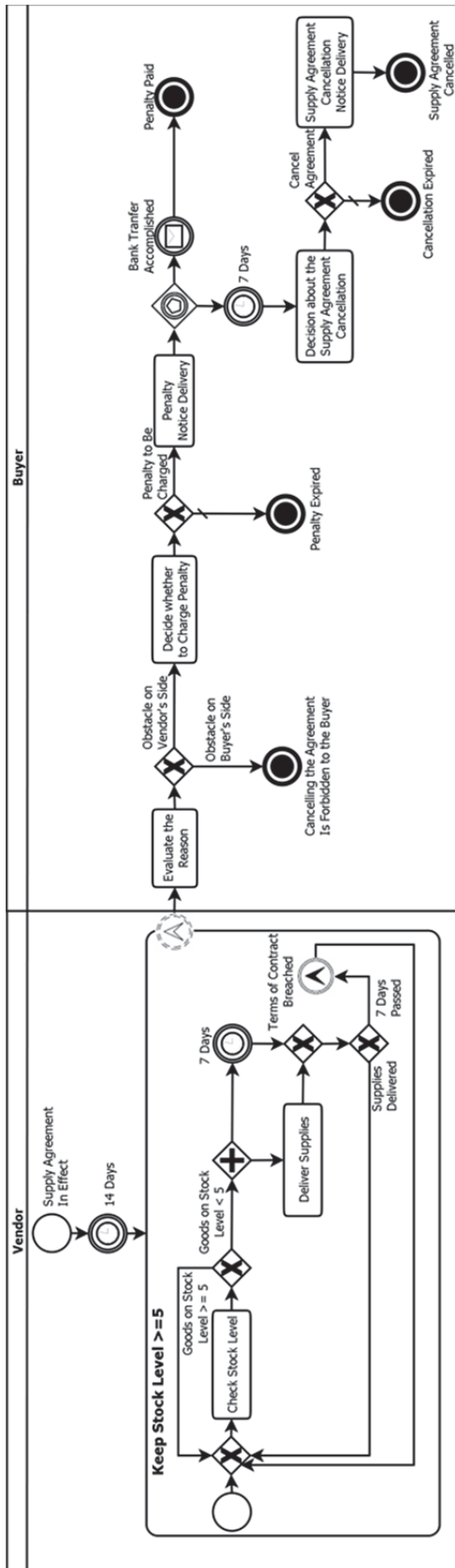


Figure 1 Example modelled in the BPMN

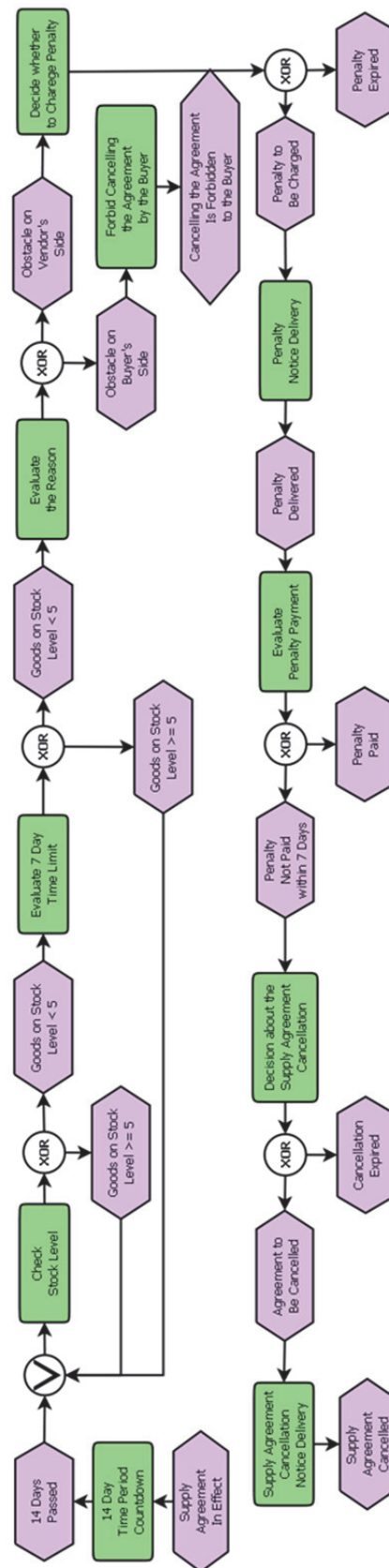
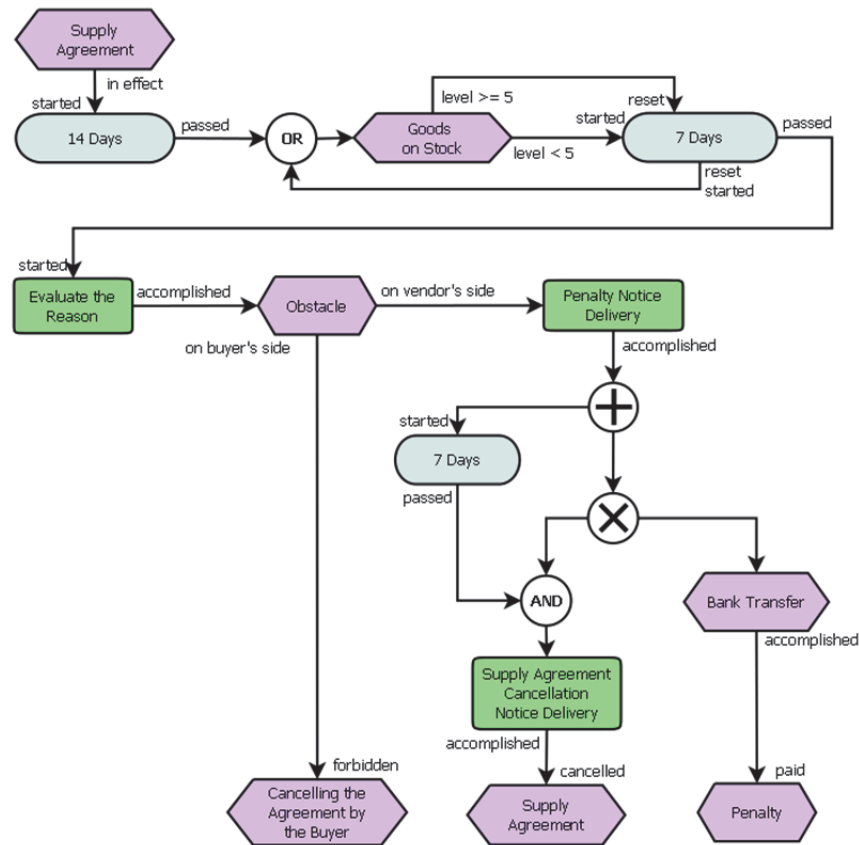


Figure 2 Example modelled in the EPC



**Figure 3** Example modelled in the PSD

ments (as in point 2 above) instead of being captured formally by relevant symbols.

The right to cancel the contract is missing. There is only the decision activity *whether to cancel the agreement or not* in the models and not the actual reason which constitutes the enforceable right. The imprecise capturing of the right has the same problems and reasons as above.

The explicit responsibility of the vendor for the bank to pay on time is missing. We can see that we only wait for the bank transfer to occur. The fact that the bank has to do this on behalf of the vendor and that it is the vendor who is responsible for the bank correct timed activity are missing. This could be solved by modelling the vendor's payment as an activity with its sub-process, which would include the internal procedures of the vendor and its negotiations with the bank. In our opinion, the complexity of this solution outweighs the benefits – the clarity would be lost in complexity. That is why we have settled with the implicit solution presented here.

Overall, it is hard to differentiate what is just a standard procedure and what is a legally enforceable duty or right that can be claimed in court. This detail is lost within the *implementation* of the duties and rights into the relations between activities.

There is an option that the states of individual duties and rights could be included in the model as objects and their states, but without further analysis, this would make the model very complicated and hard to read. This inclusion of object flows would look like adding textual comments (see point 2 above), which would overpopulate the model. Instead, we analyse this option in greater detail and try to formalise the representation of the duties and rights so that, when used in a model, the model stays clear and readable.

### 3. Capturing duties and rights explicitly

The analysis in section 2.2 shows that capturing the rights and duties with contemporary and popular process modelling languages has its pitfalls, which make the rights and duties mostly invisible in the models since they lose their explicit nature and are turned into descriptions that make them implicit. The reader of the model has to deduce what the rights and duties are. This is not always possible, especially when the detail is gone – as in the case of the vendor's responsibility for the stock level in the example scenario.

In this section, we analyse the possible inclusion of the rights and duties into a process model further on. This time, we are explicit, so that they have their own

symbols and can be easily recognised and correctly captured in the model. Based on the relevant literature, we analyse what duties and rights actually are and how they can be represented as individual entities in a process model.

### 3.1 Duty

A duty is defined as *a legal obligation, the breach of which can result in liability. In a lawsuit, a plaintiff must claim and prove that there was a duty by defendant to plaintiff* (Gerald and Hill, 2005a).

The three concepts (legal, obligation and liability) on which this definition is built deserve more detailed analysis.

#### Legal

As the definition source (Gerald and Hill, 2005a) notes, a duty does not necessarily have to be of legal origin. For the purpose of modelling duties, we extend the definition above and we work with the two properties of an obligation that make it a duty:

- The obligation has to be *enforced*. If the obligation is not enforced, there is no reason to pay attention to it since nobody would care if it were accomplished or not.
- The accomplishment of the obligation has to be *subject to a third party review*. If the accomplishment of the obligation is not subject to a third party review, there is no reason to formalise and capture it since there would be no third party to review the accomplishment of the obligation – it would be just a private relation between an actor and an enforcer.

#### Obligation

What is meant by the term obligation we can find, for instance, in Wenar (2011) as a part of the claim's definition: *(not) to perform certain actions or (not) be in certain states*. This means that the obligation does not have to be only an activity that has to be done or avoided, but it can be a responsibility for certain states, too. This responsibility can be either subjective or objective, as discussed in the liability section below.

As we can see in the obligation definition above, it is either active (*facere, dare*) or passive (*omitere, pati*) (Pecina, 2006c). One is either obliged or forbidden to do something or is responsible for certain states to occur or to be prevented.

#### Liability

Liability is either objective or subjective (Pecina, 2006a).

Subjective liability represents a responsibility where one is liable for his or her own actions or

omissions. In cases where damage was caused, in order to make one liable for it, it has to be proven that one's actions or negligence resulted in this damage.

Objective liability represents responsibility where one is liable for certain actions or omissions. It does not have to be proven that the damage was caused by one's actions or negligence. One is liable for the damage regardless of who actually caused it.

Since *liability means the legal responsibility for one's acts or omissions* (Gerald and Hill, 2005b), the above described liability differentiation is relevant for the obligation definition. The obligation is either subjective or objective, too. This means that the obligation may represent responsibility not only for one's actions but also for the actions of others.

The analysis above leads us to the following conclusions: a duty is an enforced obligation, which defines that one has to (must not) perform a certain action or has to be (has not to be) in a certain state or is (is not) responsible for a certain action or state and those accomplishment is subject to a third party review.

### 3.2 Right

A right is defined as *entitlement (or not) to perform certain actions, or (not) be in certain states; or entitlement that others perform (do not perform) certain actions or are (not) in certain states* (Wenar, 2011).

According to Wenar (2011), there are four types of rights:

- privilege,
- claim,
- power,
- immunity.

In our analysis, we work further on with the first two, the so-called primary rules, since the other two (secondary rules) are not about actions and states but about introducing, changing and altering primary rules (Wenar, 2011). This is outside the focus of this paper.

In further analysis, we consider these two definitions of a right:

- The privilege, which represents the first part of the definition above. This is an entitlement (not) to perform certain actions or (not) to be in certain states.
- The claim, which represents the second part of the definition above. This is an entitlement that others (do not) perform certain actions or are (are not) in certain states.

Unlike a privilege, which is constituted only by entitlement, a claim consists of two parts: the entitlement and the subsequent duty. Together they make a couple, which forms a claim.

One can notice that the definitions contain similar properties of the right to the duty. As the obligation can be active or passive, the entitlement can be for activity or passivity and as the obligation can be an action or responsibility for a certain state, the entitlement can be for an action or compliance with a certain state.

### 3.3 Modelling duties and rights

Upon the analysis above, we can formalise two concepts to include in a process model. One is a duty, which always represents one's obligation, and the other one is a right, which always represents one's entitlement. In the case of a claim, this is represented by a combination of a right and the subsequent duty.

The discussion on the inclusion of duties and rights into process models is based on the model from the Methodology for the Modelling and Analysis of Business Processes (Figure 6), which places process models into the whole modelling context.

In this model, duties and rights are objects and it is our focus on them that makes them worth pointing out by capturing them with special symbols in a process model. In order to model them as objects of *special interest*, it is necessary to define their lifecycles first (Řepa, 2007).

When searching for the starting point of a duty's or a right's lifecycle, we have to take into consideration the fact that in this case we are not dealing with a legal document that goes through several reviews and after which it is approved in several rounds and then becomes effective (epravo.cz, 2012) in a specified time. The duties and rights are in our case atomic parts of the document's content that come to *life* exactly when their time comes – when the specified event that brings them into effect occurs.

As a duty emphasises accomplishment, there are two possible outcomes when it is in effect. It is either fulfilled or failed. In other words, the obligation is either realised by the responsible person or it is not.

The right, which is in effect, also has two possible outcomes. It is either used by the entitled person or expires. In other words, we can say that the right is either realised by the entitled person or it is not.

For both duty or right, it is valid that they can be revoked when in effect.

The identical lifecycle of the duty and right allows us to unite both lifecycles into one, which we call the lifecycle of a *norm* (compare with Pecina, 2006b). Figure 4 captures the lifecycle of a norm in UML state chart notation (Object Management Group, 2011).

The events that cause the transitions of a norm's states are dependent on the modelled situation, i.e.

they are usually different for each modelled right or duty.

As criteria for the usefulness of capturing a right or a duty as a norm, we should consider the two criteria specified for a duty. A right or a duty has to be enforced and its accomplishment subject to a third party review in order to model it as a norm. Only when these two conditions are met is it reasonable to capture them as a norm in a process model.

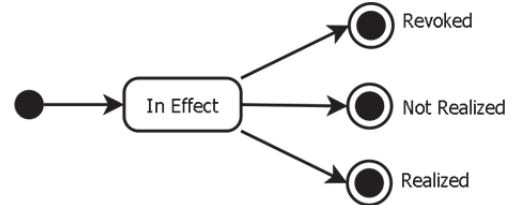


Figure 4 Lifecycle of a Norm

## 4. Example scenario modelled with the PSD extension

In the following section, we implement the above-defined formal representation of duties and rights as a PSD extension and demonstrate its benefits using the example scenario. We have chosen the PSD for the implementation since this extension fits into the PSD's philosophy perfectly due to its focus on formal lifecycles and state transitions.

We use the following symbol for capturing a norm (Figure 5).

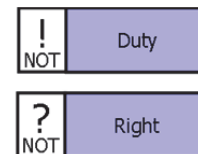


Figure 5 Symbol for a norm in the PSD

The symbol differentiates between a right and a duty by the left placed sign. The exclamation mark signifies a duty, while a question mark signifies a right. The text associated with the symbol should contain the norm's description. In addition, the NOT sign signifies the activity (if not present) or passivity (if present) of the obligation or entitlement (for details, see the definitions of a duty or a right) and the entitled or responsible person should be captured as an associated actor.

This extension allows us to model the example scenario at two levels of detail: one that focuses on duties and rights and that leaves the details hidden (Figure 7) and another that, in addition to the previous one, contains all the relevant details (Figure 8).

The figures show that the application of the defined PSD extension changes the focus of the model.



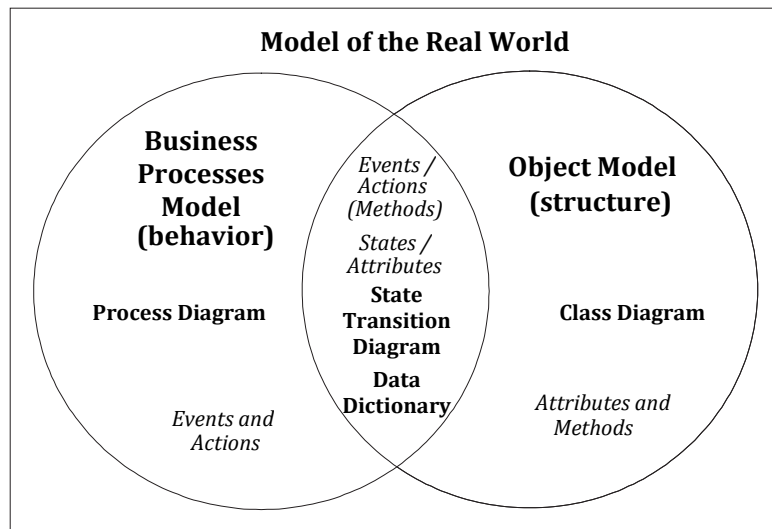


Figure 6 MMABP model of reality (Řepa, 2007)

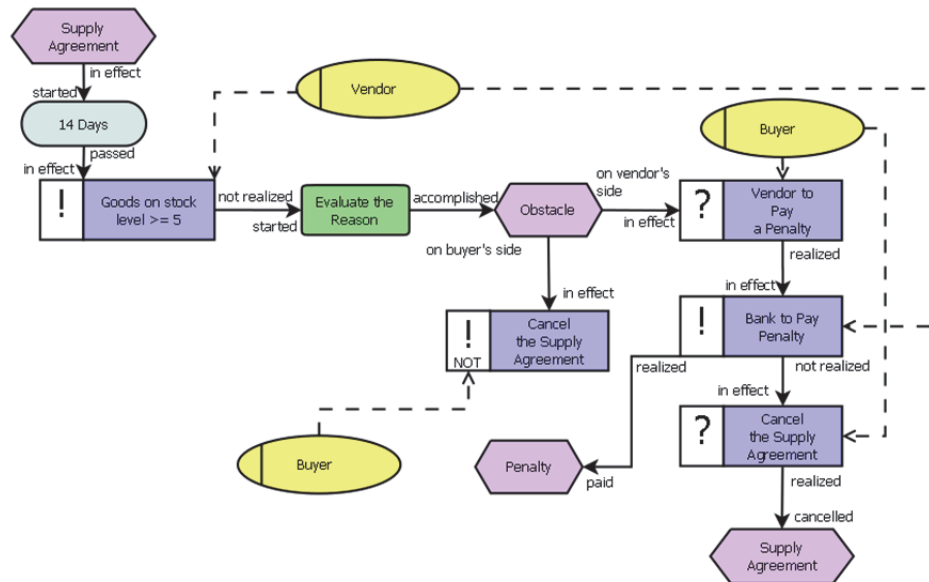


Figure 7 Overview model of the example scenario modelled with the PSD extension

The focus on modelling relations between activities is changed to focus on modelling relations between duties and rights. This helps the analyst focus on what is important in this case – the duties and rights of individual parties and the consequences if not respected.

Of course, this requires analysts use the extension wisely. One should use the duties and rights extension only in those cases when the modelled reality requires it. There should be fulfilled the two criteria mentioned in the analysis above at least.

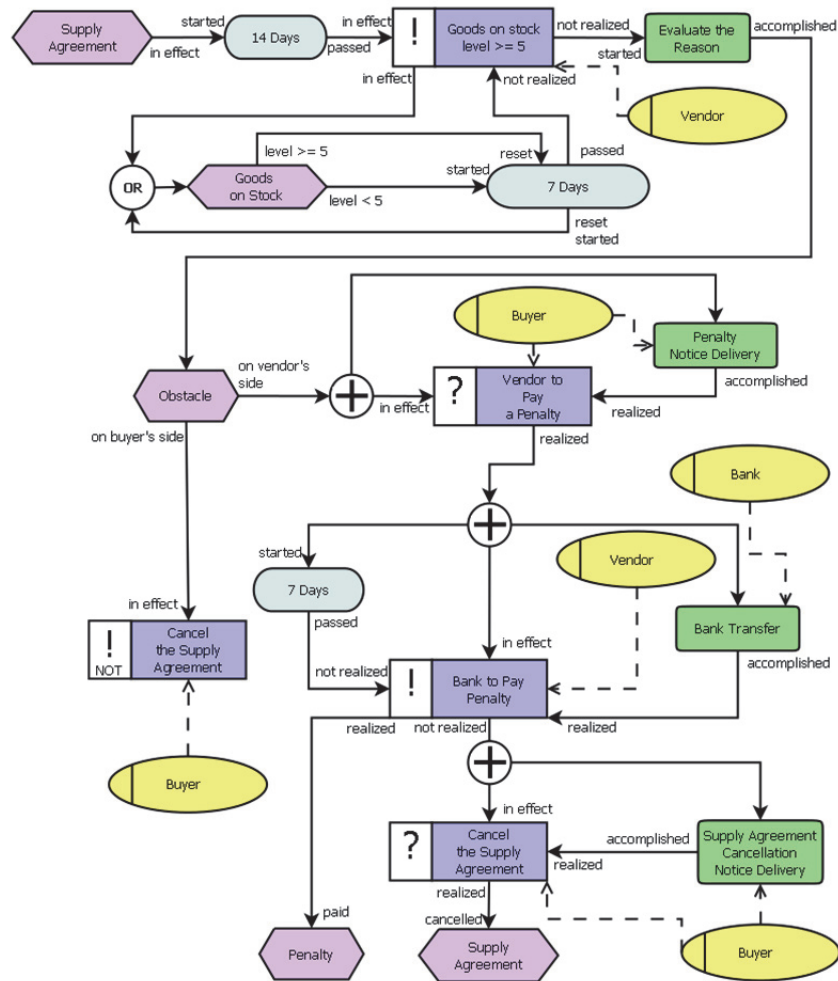
Figure 7 provides a basic overview of the duties and rights of the involved parties and illustrates some of the duty and right types listed in section 3. The duty

*Goods on Stock Level >=5* represents active responsibility, whereas the *Cancel Supply Agreement* duty represents a forbidden (passive) activity. The right *Vendor to Pay Penalty* represents a claim bound with the following *Bank to Pay Penalty* duty, whereas the *Cancel Supply Agreement* right represents a privilege.

Figure 8 captures the whole detail of the example scenario including the clearly specified events and their effects on the lifecycles of the individual norms. This figure has the following advantages over the models in section 2.2.

The vendor's duty is clearly captured including the limiting time period. Readers at the first sight know





**Figure 8** Example scenario modelled with the PSD extension

for what the vendor is responsible and how this responsibility is defined. Unlike the solution provided by the BPMN, this solution does not force an analyst to go into greater detail than is necessary.

The model differentiates between enforceable duties and rights and regular activities. The decision about which side the obstacle was is captured only as an activity *Evaluate the Reason* since this is only an expected activity on the buyer's side – it is neither regulated by the supply agreement nor subject to legal enforcement.

The rights and events, which signify the usage of the right or which make the rights expire (in cases defined by the scenario), are captured clearly.

Those actors affected by the rights and duties are formally captured by the actor symbols and are not hidden in text comments.

The vendor's responsibility for the bank making the bank transfer on time is clearly visible. All this is possible even without the usage of a sub-process.

Overall, the inclusion of rights and duties in the process model brings a different perspective into the modelling process itself. One starts noticing which states are important for the norms and that helps an analyst ask the right questions: What brings the norm into effect? What happens if the duty is failed?

## 5. Conclusions

In this paper, we looked at the problems process modelling has with the inclusion of the important legal aspects that are an undividable part of modelled processes spanning several businesses. These discussed aspects are the duties and rights present in legal documents, which regulate the places where one process crosses from one business into the other. We defined an example scenario and on this basis ana-

lysed the capabilities of contemporary process modelling languages to capture rights and duties in a process model.

The analysis showed that contemporary process modelling languages are not able to capture the example clearly and completely and that the direct process modelling approach is not the best for this scenario since the duties and rights are modelled as implicit. One has to guess from the model what a right is and what a duty is. The detail provided by the process model makes the reader always wonder what legally binding rights and duties are and what the internal business procedures are. The modelled processes represent the *implementation* of the duties and rights described in legal documents; therefore, when a process model was created, some of the meta-data (what a duty is and what a right is) were lost.

Upon unsatisfactory results by contemporary process modelling languages in capturing the example scenario, we decided to include the duties and rights into a process model explicitly. We analysed and formalised the duty and the right in order to be able to capture them correctly. Based on the analysis, we created an extension to the PSD modelling language, which allows analysts to capture duties and rights explicitly. The model of the example scenario, modelled with the help of the introduced extension, shows a shift from modelling relations between activities to relations between duties and rights in those parts of the model where it is desired. This allows for the clear and complete capturing of the duties and rights in the process model. At the same time, analysts have to keep in mind that the duties and rights extension should be used only in cases where the modelled reality requires it. The introduced extension does not replace the traditional activity flow approach. It just helps include further detail into a process model when dealing with duties and rights.

We conclude that we identified the weaknesses of contemporary process modelling languages that limit their ability to capture duties and rights precisely and we suggested an extension to contemporary process modelling languages that provides analysts with a solution for how to overcome the identified weaknesses in order to capture duties and rights in process models precisely.

The introduced PSD extension is not the only one possible. Duties and rights can be included in other process modelling languages, but this will not likely be as smooth an integration as in the case of the PSD.

The inclusion of duties and rights into a process model has potential applications in other areas, especially in public administration. Projects such as the Registry of Rights and Obligations by the Ministry of the Interior of the Czech Republic show that the

formalisation of duties and rights is a current topic and that the results of this paper may be used for further research in this area.

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